

Through Mask Etching of Metal Parts using the FARADAYIC Process

Objective:

This project demonstrated the feasibility of using the patented FARADAYIC Process for through mask etching of metal parts.

Summary:

FARADAYIC ElectroEtching is an electrically mediated process that involves applying a voltage between the part of interest and a counter electrode to electrochemically remove the metal not covered by the mask. The voltage is periodically interrupted to improve the current distribution and provide fast vertical etching rates while minimizing the lateral etching rates underneath the mask. FARADAYIC ElectroEtching utilizes a nonaggressive bath chemistry to enable highly controlled process start and end points, and produces features with lower undercut values as well as better etching ratios for varying size features on test vehicles when compared with DC and spray etching. Shown are photographs of in-house test pieces resulting from FARADAYIC Etching; parts from commercial clients are not shown due to confidentiality. Faraday also designed and built a pilot-scale electrochemical cell that can accommodate test parts and could be adapted for a range of geometries.



Background:

The patented FARADAYIC Process is an electrochemical manufacturing technique that utilizes a controlled electric field for etching, polishing or shaping a metallic work piece. Since the FARADAYIC Process is electrically mediated, it does not require aggressive chemicals to facilitate the metal removal as needed in conventional chemical processes (e.g. chemical etching). The material removal rate is determined by the applied electric field, which is user-defined and computer controlled. This provides the means for precise control of the length of the process and the total material removed. Additionally, the use of neutral salt solutions (e.g. sodium chloride and sodium nitrate) as the electrolyte makes the process both worker and environmentally safe.



The FARADAYIC Process technology illustrated above is protected by a substantial patent portfolio including issued, allowed, and pending patent actions.